J. A. HEBERT.

APPARATUS FOR RAISING LIQUIDS FROM DEEP WELLS.

APPLICATION FILED AUG. 7, 1919.

1,339,621. **Patented May 11, 1920.**

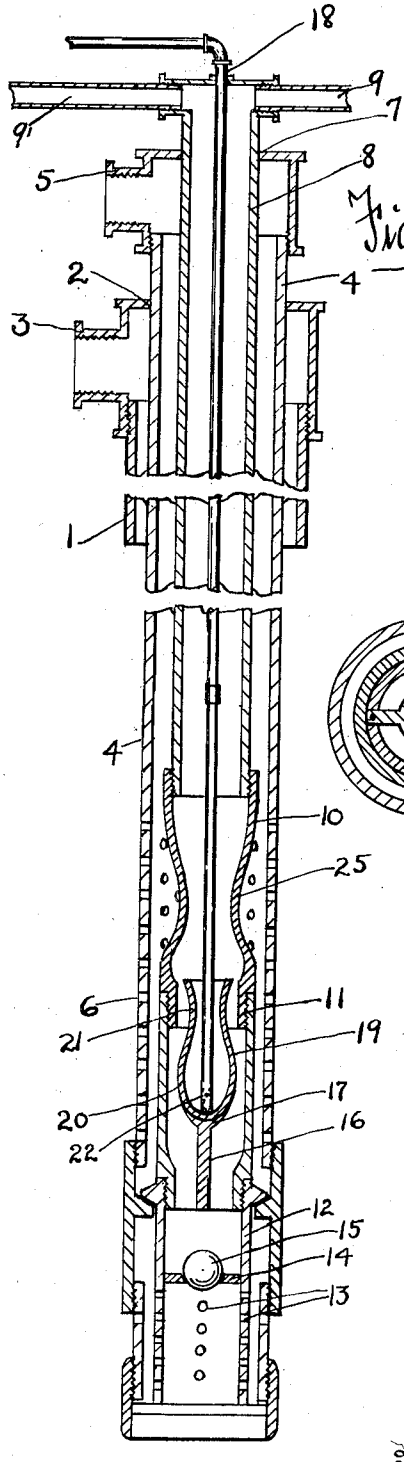


Fig. 1.

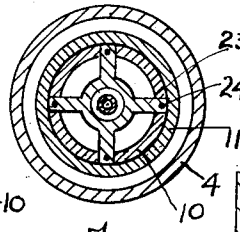


Fig. 3.

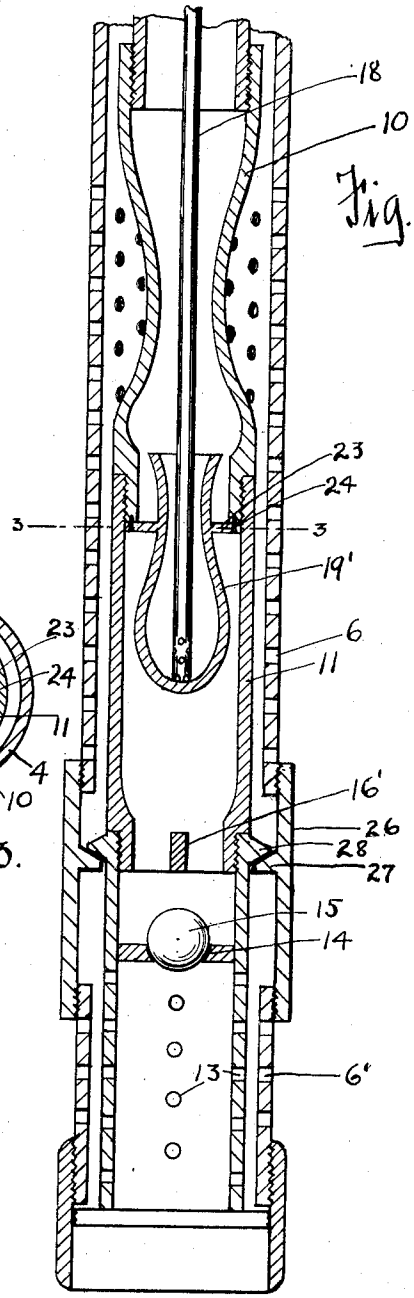


Fig. 2.

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APPARATUS FOR RAISING LIQUIDS FROM DEEP WELLS.

1,339,621. Specification of Letters Patent. Patented May 11, 1920.

Application filed August 7, 1919. Serial No. 315,813.

To all whom it may concern:

Be it known that I, JOSEPH A. HEBERT, a citizen of the United States, residing at Freeport, Brazoria county, Texas, have invented a certain new and useful Improvement in Apparatus for Raising Liquids from Deep Wells, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in apparatus for raising liquids from deep wells. It has particular application to the raising of fused sulfur from the well in the liquid state, but it is obvious that this apparatus may be used in other relations, and I do not wish to be understood as confining the application of this device to sulfur mining alone.

An object of my invention is to provide a novel and improved device for delivering compressed air or other fluid into the sulfur discharge pipe in sulfur mining apparatus so that the greatest efficiency in the use of fluids for pumping purposes is obtained, and so that air, steam or even water may be used to lift the sulfur.

Another object is to so construct the apparatus by which the lifting fluid is delivered into the sulfur discharge that it may be easily installed in the well and in which the blast of air will be delivered in an upward direction through a constricted passage, thereby obtaining a more efficient lifting effect than in the ordinary type of air lift.

Referring to the drawings forming a part of this specification and wherein like parts are designated by like numerals of reference throughout the several views, Figure 1 is a central longitudinal section through a sulfur mining apparatus as installed in the well showing the application of my invention; Fig. 2 is a detail of the lower part of the series of pipes disclosed in Fig. 1 and illustrating a slightly different embodiment thereof; Fig. 3 is a transverse section on the plane 3—3 of Fig. 2.

While it is not claimed to be new to lift fused sulfur from deep wells by means of a discharge into the sulfur pipe of compressed air, the ordinary type of air lift now in use for that purpose has certain defects which the improved design of air discharge which I have invented is intended to obviate.

In the drawing I have shown a type of sulfur mining apparatus now in use in sulfur wells wherein there is an outer casing or pipe 1 extending from the surface of the ground downwardly to the sulfur bearing rock. The upper end of this pipe 1 has a close contact at 2 with a smaller pipe inside the same and concentric therewith. A laterally branching inlet pipe 3 connects therewith and furnishes an entrance for a stream of hot fluid such as water or steam for the purpose of fusing the sulfur in the underground strata. This pipe, as will be noted, is adapted to deliver the fluid toward the upper part of the strata and is called the "top heat" pipe.

The pipe 4 next inside the pipe 1 has at its upper end an entrance connection 5 adapted to couple with a pipe leading from the boiler to the pipe 4 to deliver a second stream of hot fluid which is discharged downwardly toward the bottom of the sulfur bearing strata. This pipe is perforated at 6 adjacent the sulfur rock and discharges the heated fluid against the material toward the bottom of the well, and is therefore, termed the "bottom heat" pipe. A short imperforate section 26, having an inwardly projecting annular seat 27, is arranged a short distance from the lower end of pipe 4.

Said pipe 4 also has a close fit at the upper end at 7 with a smaller concentric pipe 8 therein. This pipe is intended principally for the discharge of the heated sulfur from the well. Pipes 9 and 9′ connect with the upper end of the pipe 8 and are adapted to discharge heated fluid into said pipe when desired or to conduct therefrom the heated sulfur when the sulfur pump is operating. The pipe 8 connects, adjacent the lower end of the well, with a section 10 shaped like a Venturi tube, being constricted toward the middle portion thereof and enlarged again toward the lower end to form a coupling with another section 11, cylindrical in shape, which is in turn threaded into connection with the valve chamber 12 at the bottom of the well. The valve chamber is imperforate above the valve and has an outwardly extending annular flange adapted to contact with the seat 27 on the section 26 to form a seal to prevent the heating fluid from further progress downwardly so as not to mix with the fused sulfur flowing in below. Said valve chamber 12 is perforated at 13 below

the valve and provided with a valve seat 14 upon which a ball valve 15 is seated. At the lower end of the section 11 a transverse bar 16 is placed, this bar acting to limit the upward movement of the ball valve 15 and also as a support for the lower end of the air discharge pipe. For the latter purpose it is formed with a seat 17, on the upper surface thereof, to receive the air discharge apparatus.

The air is discharged into the sulfur outlet pipe by means of a small inner pipe 18 which is connected at its upper end with an air compressor, not shown, and is passed downwardly through the center of the sulfur pipe 8 and terminates at its lower end in a discharge cup 19 to which it is secured at the central lower end thereof. The discharge cup 19 is enlarged toward the lower end at 20 and is constricted adjacent the upper end at 21 for the better delivery of the air blast. The pipe 18 is also perforated at 22 at the lower end where it connects with the discharge cup 19, which is supported on the seat 17 on the bar 16.

In the enlarged detail of my apparatus, shown in Fig. 2, the discharge cup 19′ is provided with laterally projecting arms 23, by which it is secured by means of set screws 24 to the lower end of the pipe section 10. The air delivery pipe 18 is not, in this modification, secured to the discharge cup but may be removed therefrom. It is, also, unnecessary to extend the bar 16′ upwardly to form a seat for the discharge cup as the same is made secure by the attaching means just described.

In the operation of my apparatus the sulfur in the mine will be fused by the discharge of heating fluid through the top and bottom heat pipes into the sulfur strata. The fused sulfur will flow into the bottom of the well and find entrance to this apparatus through the openings 6′ and 13 into the sulfur discharge pipe. The pressure of the heating fluid and the head of the sulfur in the well will cause the sulfur to flow upwardly past the valve 15 into the discharge pipe. Air is forced downwardly through the pipe 18 and delivered through the perforations 22 into the discharge cup 19, from which it is discharged upwardly through the constricted passage 21 between the pipe and the discharge cup in a strong upward blast into the Venturi tube 10. This blast delivered into the constricted passage 25 of the Venturi tube 10 increases the velocity of the upward moving current of sulfur in the narrow passage 25 and causes the head of the sulfur in the tube 8 above to flow rapidly upward. It is possible, with this air delivery device, to obtain in the passage 25 a sufficient force or lifting effect of air upon the sulfur in the pipe above due to the increased velocity of the blast to greatly increase the flow which is ordinarily obtained where the air discharge is delivered outwardly into the ordinary type of sulfur discharge pipe. It has in fact been found possible to use a stream of hot water or steam, instead of air, with my apparatus and obtain an efficient discharge of the sulfur. The use of the valve 15 in a sulfur mining apparatus will keep the apparatus primed at all times and make it possible to pump the well intermittently when desired and still retain the apparatus in such shape that it will operate as soon as the air discharge is delivered thereto. The presence of the hot water or steam in the pipes 1 and 8 respectively will maintain the sulfur standing in the pipe in its fluid condition so that there will be no danger of the material congealing while the well is not operating. The valve will also effectively prevent a downward discharge into the sulfur during operation. The valve is not, however, an essential element in my invention and may, if desired, be omitted.

Having thus described my invention, the objects and advantages of which will be apparent without further elaboration, what I claim is new and desire to protect by Letters Patent is:

1. In a device for sulfur mining, an outer perforated pipe, an inner imperforate sulfur discharge pipe, a closure between said pipes adjacent the lower ends thereof, a valve chamber on the lower end of said sulfur pipe having perforations on the lower portion thereof, an air pipe in said sulfur pipe and a delivery chamber at the lower end of said air pipe, said sulfur pipe having a constricted passage immediately above said delivery chamber through which the air is adapted to pass.

2. A device for raising sulfur from deep wells comprising an outer perforated pipe, an inner imperforate sulfur discharge pipe, means to close the passage between said pipes adjacent the lower ends thereof a chamber in the lower end of said sulfur pipe, a constricted passage above said chamber, and an air pipe adapted to discharge a blast of air upwardly through said passage.

3. A device for raising sulfur from deep wells comprising means to discharge a heated fluid into the well, a sulfur outlet pipe, means to prevent the entrance of the heated fluid to said sulfur outlet pipe, an upwardly opening valve in said pipe, a constricted passage above said valve, and an air pipe passing downwardly through said pipe and arranged to discharge air upwardly through said passage.

In testimony whereof I hereunto affix my signature this the 31st day of July A. D. 1919.

JOSEPH A. HEBERT.